

(19)



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(11)

**EP 1 090 558 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
11.04.2001 Bulletin 2001/15

(51) Int Cl.7: **A23L 1/308**

(21) Application number: **99203295.3**

(22) Date of filing: **08.10.1999**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventors:  
• **Burri, Josef**  
**1066 Epalinges (CH)**  
• **Guex, Claude**  
**1400 Yverdon-les-Bains (CH)**

(71) Applicant: **SOCIETE DES PRODUITS NESTLE  
S.A.**  
**1800 Vevey (CH)**

(74) Representative: **Wavre, Claude-Alain et al**  
**55, avenue Nestlé**  
**1800 Vevey (CH)**

(54) **Psyllium husk product**

(57) A psyllium husk containing intermediate product consisting of a cooked-extruded mixture comprising psyllium husk, cereal bran, a vegetable binder and disodium phosphate, and a ready-to-eat cereal product

consisting of agglomerated particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids which are coated with a syrup mainly comprising sugar and vegetable oil or fat.

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## Description

[0001] The present invention relates to a psyllium husk containing intermediate product, a process for manufacturing the intermediate product, a ready-to-eat cereal product containing the intermediate product, and a process for manufacturing the ready-to-eat cereal product.

## The state of the art

[0002] EP0105195 (SEARLE) discloses a process for sanitizing psyllium hydrophilic mucilloid by exposure to moist heat under elevated pressure in an extruder.

[0003] W09507632 (KELLOGG) discloses a ready-to-eat cereal having superior organoleptic properties while containing from about 6 to 19% by weight of extruded pre-wetted pure psyllium.

[0004] US5223298 (KELLOGG) discloses a ready-to-eat cereal product obtained by admixing a precooked bulk cereal ingredient with an intermediate product which preferably contains about 75% psyllium and forming the mixture into shaped cereal pieces which contain about 2-30% by dry weight psyllium.

[0005] EP0144644 (PROCTER & GAMBLE) discloses an expanded high fiber bar made by a process comprising dry mixing about 10 to 80% by weight of psyllium mucilloid, about 10 to 30% by weight percent expander and further dietary fiber from a grain source, and extruding the mixture with water at a temperature of from 150 to 200°C.

## The objects of the invention

[0006] A first object of the present invention is to provide a cooked-extruded psyllium husk containing intermediate product which comprises from about 84 to 96% by weight psyllium husk and which is suitable for manufacturing a ready-to-eat cereal end product.

[0007] A second object of the present invention is to provide a process for manufacturing such a psyllium husk containing intermediate product.

[0008] A third object of the present invention is to provide a ready-to-eat cereal product containing the intermediate psyllium husk product which may be eaten as such or in addition to a light meal such as a musli or a yogourt, for example.

[0009] A fourth object of the present invention is to provide a process for manufacturing such a ready-to-eat cereal product.

## The invention

[0010] To this end, the present psyllium husk containing intermediate product consists of a cooked-extruded mixture comprising, in percent by weight of the intermediate product, from 84 to 96% of psyllium husk, up to 8% of oil or fat, up to 10% of cereal bran, up to 10% of

vegetable binder and up to 1.5% disodium phosphate.

[0011] The present process for manufacturing a psyllium husk containing intermediate product consists of preparing a mixture comprising, in parts by weight, from 84 to 96 parts of psyllium husk, up to 8 parts of oil or fat, up to 10 parts of cereal bran, up to 10 parts of vegetable binder, up to 1.5 parts of disodium phosphate and added water up to a water content of from 24 to 45%, cooking-extruding the mixture at a temperature of from 130 to 220°C under a pressure of from 10 to 18 MPa for from 5 to 50 s, obtaining a rope of expanded thermoplastic mass, cutting the rope into pieces, and drying them.

[0012] The present ready-to-eat cereal product consists of agglomerated particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids which are coated with a syrup mainly comprising sugar and vegetable oil or fat.

[0013] The present process for manufacturing a ready-to-eat cereal product consists of preparing a dry mixture of particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids, agglomerating the particles and/or flakes by mixing the dry mixture with a syrup mainly comprising sugar and vegetable oil or fat, and drying the agglomerates thus obtained.

[0014] It has surprisingly been found that it was possible in this way to provide a cooked-extruded psyllium husk containing intermediate product which comprises from about 84 to 96% by weight psyllium husk and which is suitable for manufacturing a ready-to-eat cereal end product containing it which may be eaten as such or in addition to a light meal such as a musli or a yogourt, for example.

## General description of the intermediate product

[0015] The present cooked-extruded psyllium husk containing intermediate product comprises, in percent by weight of the intermediate product, from 84 to 96% of psyllium husk, up to 8% of oil or fat, up to 10% of cereal bran, up to 10% of vegetable binder and up to 1.5% disodium phosphate.

[0016] The psyllium husk may be in powdered form, for example.

[0017] The psyllium husk containing intermediate product preferably comprises from 3 to 8% of oil or fat.

[0018] The oil or fat may be butter oil and/or a vegetable oil or fat which may act as lubricating agent in the cooking-extruding process, for example.

[0019] The psyllium husk containing intermediate product preferably comprises from 2 to 10% of cereal bran.

[0020] The cereal bran may be wheat, barley, oat, rice and/or corn bran or bran concentrate, for example.

[0021] The psyllium husk containing intermediate product preferably comprises from 2 to 10% of vegetable binder.

[0022] The vegetable binder may be a flour, especially

## Description

[0001] The present invention relates to a psyllium husk containing intermediate product, a process for manufacturing the intermediate product, a ready-to-eat cereal product containing the intermediate product, and a process for manufacturing the ready-to-eat cereal product.

## The state of the art

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## The objects of the invention

[0006] A first object of the present invention is to provide a cooked-extruded psyllium husk containing intermediate product which comprises from about 84 to 96% by weight psyllium husk and which is suitable for manufacturing a ready-to-eat cereal end product.

[0007] A second object of the present invention is to provide a process for manufacturing such a psyllium husk containing intermediate product.

[0008] A third object of the present invention is to provide a ready-to-eat cereal product containing the intermediate psyllium husk product which may be eaten as such or in addition to a light meal such as a musli or a yogourt, for example.

[0009] A fourth object of the present invention is to provide a process for manufacturing such a ready-to-eat cereal product.

## The invention

[0010] To this end, the present psyllium husk containing intermediate product consists of a cooked-extruded mixture comprising, in percent by weight of the intermediate product, from 84 to 96% of psyllium husk, up to 8% of oil or fat, up to 10% of cereal bran, up to 10% of

vegetable binder and up to 1.5% disodium phosphate.

[0011] The present process for manufacturing a psyllium husk containing intermediate product consists of preparing a mixture comprising, in parts by weight, from 84 to 96 parts of psyllium husk, up to 8 parts of oil or fat, up to 10 parts of cereal bran, up to 10 parts of vegetable binder, up to 1.5 parts of disodium phosphate and added water up to a water content of from 24 to 45%, cooking-extruding the mixture at a temperature of from 130 to 220°C under a pressure of from 10 to 18 MPa for from 5 to 50 s, obtaining a rope of expanded thermoplastic mass, cutting the rope into pieces, and drying them.

[0012] The present ready-to-eat cereal product consists of agglomerated particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids which are coated with a syrup mainly comprising sugar and vegetable oil or fat.

[0013] The present process for manufacturing a ready-to-eat cereal product consists of preparing a dry mixture of particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids, agglomerating the particles and/or flakes by mixing the dry mixture with a syrup mainly comprising sugar and vegetable oil or fat, and drying the agglomerates thus obtained.

[0014] It has surprisingly been found that it was possible in this way to provide a cooked-extruded psyllium husk containing intermediate product which comprises from about 84 to 96% by weight psyllium husk and which is suitable for manufacturing a ready-to-eat cereal end product containing it which may be eaten as such or in addition to a light meal such as a musli or a yogourt, for example.

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[0015] The present cooked-extruded psyllium husk containing intermediate product comprises, in percent by weight of the intermediate product, from 84 to 96% of psyllium husk, up to 8% of oil or fat, up to 10% of cereal bran, up to 10% of vegetable binder and up to 1.5% disodium phosphate.

[0016] The psyllium husk may be in powdered form, for example.

[0017] The psyllium husk containing intermediate product preferably comprises from 3 to 8% of oil or fat.

[0018] The oil or fat may be butter oil and/or a vegetable oil or fat which may act as lubricating agent in the cooking-extruding process, for example.

[0019] The psyllium husk containing intermediate product preferably comprises from 2 to 10% of cereal bran.

[0020] The cereal bran may be wheat, barley, oat, rice and/or corn bran or bran concentrate, for example.

[0021] The psyllium husk containing intermediate product preferably comprises from 2 to 10% of vegetable binder.

[0022] The vegetable binder may be a flour, especially

a cereal or carob seed germ flour, a starch, especially a native starch from wheat, barley, rice, tapioca, potato and/or corn, maltodextrine, or a vegetable gum such as gum arabic, guar gum and/or gum carragheenan, for example.

[0023] The psyllium husk containing intermediate product may also further comprise added vitamins, oligoelements, sodium chloride and/or antioxidants, for example.

#### General description of the process for manufacturing the intermediate product

[0024] The present process for manufacturing a psyllium husk containing intermediate product consists of preparing a mixture comprising, in parts by weight, from 84 to 96 parts of psyllium husk, up to 8 parts of oil or fat, up to 10 parts of cereal bran, up to 10 parts of vegetable binder, up to 1.5 parts of disodium phosphate and added water up to a water content of from 24 to 45%, cooking-extruding the mixture at a temperature of from 130 to 220°C under a pressure of from 10 to 18 MPa for from 5 to 50 s, obtaining a rope of expanded thermoplastic mass, cutting the rope into pieces, and drying them.

[0025] The psyllium husk may be in powdered form, for example.

[0026] The mixture preferably comprises from 3 to 8 parts of oil or fat.

[0027] The oil or fat may be butter oil and/or a vegetable oil or fat which may act as lubricating agent, for example.

[0028] The mixture preferably comprises from 2 to 10 parts of cereal bran.

[0029] The cereal bran may be wheat, barley, oat, rice and/or corn bran or bran concentrate, for example.

[0030] The mixture preferably comprises from 2 to 10 parts of vegetable binder.

[0031] The vegetable binder may be a flour, especially a cereal or carob seed germ flour, a starch, especially a native starch from wheat, barley, rice, tapioca, potato and/or corn, maltodextrine, or a vegetable gum such as gum arabic, guar gum and/or gum carragheenan, for example.

[0032] The mixture may also further comprise added vitamins, oligoelements, sodium chloride and/or antioxidants, for example.

[0033] The mixture may be prepared by first mixing together powdery components to obtain a dry mix and then mixing together the dry mix and liquid or fluid components.

[0034] This mixing step may be carried out in a first mixing section of a traditional food extruder, especially a twin screw extruder, for example.

[0035] Cooking the mixture may then be carried out in subsequent sections of the extruder where the mixture is heated, compressed and sheared so that it forms a cooked thermo plastic mass.

[0036] The thermo plastic mass may be extruded by

having it pushed by the extruder screw or twin screw through the openings of a die provided for at an end of the extruder.

[0037] The die may have one or more circular openings having of from 2 to 5 mm in diameter, for example.

[0038] The thermo plastic mass may be extruded through the die into an open space at ambient temperature and at atmospheric pressure, for example.

[0039] The extruded rope of thermoplastic mass may expand a lot while coming out from the die. It is possible to restrict this expansion by providing for the presence of oil or fat in the mixture to be cooked-extruded.

[0040] Cutting into pieces the thus obtained rope of expanded thermoplastic mass may be carried out by a two or more blade cutter rotating adjacent to the die openings, for example.

[0041] Before being dried, the pieces may be flaked by rolling, namely by passing between a pair of rollers, for example.

[0042] They may then be dried down to a residual water content of from 1.0 to 4.0% by weight, for example.

[0043] The drying step may be carried out on a belt dryer, with hot air, for example.

#### General description of the ready-to-eat product

[0044] The present ready-to-eat cereal product thus consists of agglomerated particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids which are coated with a syrup mainly comprising sugar and vegetable oil or fat.

[0045] The further cereal product may be cooked-extruded, expanded or flaked cereals, for example.

[0046] The intended cereals may be wheat, barley, oat, rice and/or corn, for example.

[0047] The milk solids may be a skimmed milk powder and/or a demineralised whey powder, for example.

[0048] The ready-to-eat product may comprise, in parts by weight, from 20 to 50 parts of psyllium husk containing intermediate product, from 20 to 50 parts of further cereal product, from 5 to 15 parts of milk solids, from 15 to 40 parts of sugar and from 10 to 30 parts of vegetable oil or fat, for example.

[0049] The respective parts of sugar and vegetable oil or fat are the main components of the syrup by means of which the particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids are agglomerated with each other.

[0050] The sugar may be sucrose, dextrose and/or fructose, for example.

[0051] The vegetable oil or fat may be palm kernel fat, coco nut fat and/or any similar, relatively high melting fat or blend of vegetable oil or fat, for example.

[0052] The syrup may further comprise added aromas such as vanillin, antioxidants, sodium chloride and emulsifiers such as soya lecithin, for example.

### General description of the process for manufacturing the ready-to-eat product

[0053] The present process for manufacturing a ready-to-eat cereal product consists of preparing a dry mixture of particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids, agglomerating the particles and/or flakes by mixing the dry mixture with a syrup mainly comprising sugar and vegetable oil or fat, and drying the agglomerates thus obtained.

[0054] The syrup may be prepared by mixing together from 15 to 40 parts of sugar, from 10 to 30 parts of vegetable oil or fat, from 8 to 24 parts of water, from 0.5 to 1.5 parts of sodium chloride and adequate minute amounts of aromas such as vanillin, antioxidants and emulsifiers such as soya lecithin, for example.

[0055] Mixing the dry mixture of particles and/or flakes with the syrup may be carried out by means of any adequate mixing apparatus such as a screw mixer of the helical spring type with an axial sprinkling nozzle or with a coating drum, for example.

[0056] The dry mixture and the syrup may be mixed in a proportion of from about one third to two fifth of syrup for three fifth to two thirds of dry mixture, for example.

[0057] The agglomerates thus obtained may be dried down to a residual water content of from 1.0 to 4.0% by weight, on a belt dryer with hot air for example.

[0058] As the case may be, the agglomerates may then be slightly reduced in size by passing through a sieve which may have a mesh size of from 5 to 15 mm, for example.

[0059] The ready-to-eat product thus obtained may be conditioned in a packing providing for its protection against humidity, such as a packing made of a film with aluminium foil, for example.

[0060] The following examples are given as illustration of embodiments of the psyllium husk containing intermediate product and its manufacturing process, as well as of the ready-to-eat cereal product containing the intermediate product and its manufacturing process. The parts and percentages are by weight.

#### Example 1

[0061] For manufacturing a psyllium husk containing intermediate product, a mixture was prepared which had the following composition, (in parts, except added water):

psyllium husk fine powder	88
oat bran concentrate	6
carob seed germ flour	5.5
disodium phosphate	0.5
sunflower oil	7.6
added water, up to a water content of	27%

[0062] For preparing the mixture, the powders were first mixed together to obtain a dry mix. The dry mix, oil and added water were then mixed together in the extruder. The mixture obtained in this way was cooked-extruded with the aid of a BC-45H type CLEXTAL twin screw extruder having a screw diameter of 55 mm and a total processing length of 800 mm.

[0063] Cooking-extruding was carried out at 180°C under 14 MPa for 30 s, the two intermeshing screws rotating at 300 rpm. The cooked thermoplastic mass obtained in this way was extruded through a die having two circular openings 2.5 mm in diameter.

[0064] The thermoplastic mass was extruded into ambient air and immediately cut with a four blade cutter rotating adjacent to the openings at 4500 rpm.

[0065] The particles thus obtained were flaked between a pair of rollers down to a thickness of 0.8 mm.

[0066] The flakes were then dried with hot air on a belt dryer to a residual water content of 1.4%, and cooled.

#### Example 2

[0067] For manufacturing a ready-to-eat cereal product containing the intermediate product, a syrup was prepared which had the following composition (parts):

sucrose	21.35
vegetable oil blend	14
sodium chloride	0.5
vanillin	0.05
soya lecithin	0.05
citric acid	0.05
water	8

[0068] For preparing the syrup, the components were mixed together in a double walled tank while being heated to about 50°C.

[0069] A dry mixture was prepared by mixing together 34 parts of psyllium husk containing intermediate product flakes obtained as disclosed in Example 1, 26 parts of thin oat flakes, and 6 parts of demineralized whey powder.

[0070] The dry mixture was mixed with 44 parts of syrup by means of a coating drum or tumbler.

[0071] The agglomerates thus obtained were dried with hot air on a belt dryer to a residual water content of 2.0%.

[0072] The dried agglomerates were then slightly reduced in size by passing through a sieve which had a mesh size of 8 mm.

[0073] The ready-to-eat product thus obtained was eventually bulk packed in a packing made of a film with aluminium foil.

[0074] The ready-to-eat product had a chewy texture and an appetizing taste. They could be eaten as such or in addition to a musli or to a yogourt.

**Claims**

1. A psyllium husk containing intermediate product consisting of a cooked-extruded mixture comprising, in percent by weight of the intermediate product, from 84 to 96% of psyllium husk, up to 8% of oil or fat, up to 10% of cereal bran, up to 10% of vegetable binder and up to 1.5% disodium phosphate. 10
2. A process for manufacturing a psyllium husk containing intermediate product, which consists of preparing a mixture comprising, in parts by weight, from 84 to 96 parts of psyllium husk, up to 8 parts of oil or fat, up to 10 parts of cereal bran, up to 10 parts of vegetable binder, up to 1.5 parts of disodium phosphate and added water up to a water content of from 24 to 45%, cooking-extruding the mixture at a temperature of from 130 to 220°C under a pressure of from 10 to 18 MPa for from 5 to 50 s, obtaining a rope of expanded thermoplastic mass, cutting the rope into pieces, and drying them. 15
3. A process according to claim 2, in which, before being dried, the pieces are flaked by rolling. 20
4. A process according to claim 2, in which the pieces are dried down to a residual water content of from 1.0 to 4.0% by weight. 25
5. A ready-to-eat cereal product consisting of agglomerated particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids which are coated with a syrup mainly comprising sugar and vegetable oil or fat. 30
6. A ready-to-eat cereal product as claimed in claim 5, which comprises, in parts by weight, from 20 to 50 parts of psyllium husk containing intermediate product, from 20 to 50 parts of further cereal product, from 5 to 15 parts of milk solids, from 15 to 40 parts of sugar and from 10 to 30 parts of vegetable oil or fat. 35
7. A process for manufacturing a ready-to-eat cereal product, which consists of preparing a dry mixture of particles and/or flakes of psyllium husk containing intermediate product, further cereal product and milk solids, agglomerating the particles and/or flakes by mixing the dry mixture with a syrup mainly comprising sugar and vegetable oil or fat, and drying the agglomerates thus obtained. 40
8. A process as claimed in claim 7, wherein the syrup is prepared by mixing together from 15 to 40 parts of sugar, from 10 to 30 parts of vegetable oil or fat, from 8 to 24 parts of water and from 0.5 to 1.5 parts of sodium chloride. 45
9. A process as claimed in claim 7, wherein the agglomerates are dried down to a residual water content of from 1.0 to 4.0% by weight. 50
10. A process as claimed in claim 7, wherein the agglomerates are reduced in size by passing through a sieve which has a mesh size of from 5 to 15 mm. 55



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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 20 3295

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 384 144 A (BEDARD AIMEE M ET AL) 24 January 1995 (1995-01-24) * column 3, line 13 - line 39; examples 4,5 *	1-10	A23L1/308
Y	US 5 382 443 A (KINCAID JAMES G ET AL) 17 January 1995 (1995-01-17) * column 2, line 26 - line 31 * * column 7, line 19 - line 25 *	1-10	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search <b>MUNICH</b>		Date of completion of the search <b>16 May 2000</b>	Examiner <b>Bendl, E</b>
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